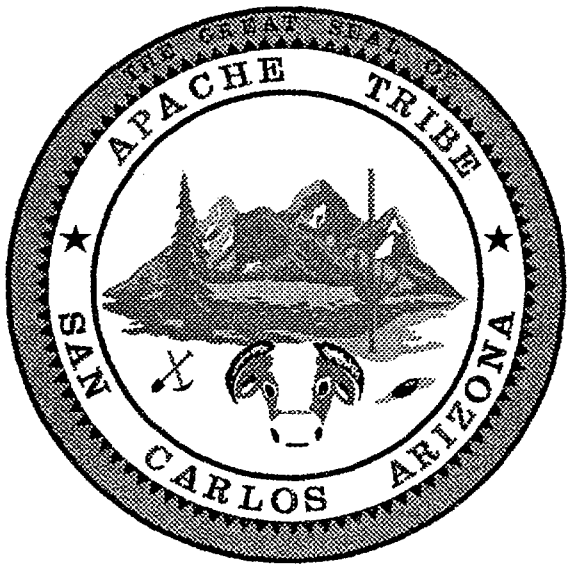
Chapter

4

FORECASTS OF AVIATION ACTIVITY



Chapter

4

FORECASTS OF AVIATION ACTIVITY

for the Airport Master Plan and Environmental Assessment for the San Carlos Apache Airport

4.0 INTRODUCTION

Forecasts of aviation activity serve as a guideline for the timing required for implementation of airport improvement programs. While such information is essential to successful comprehensive airport planning, it is important to recognize that forecasts are only approximations of future activity, based upon historical data and viewed through present situations. They therefore must be used with careful consideration, as they may lose their validity through the passage of time.

For this reason, an ongoing program of examination of local airport needs, as well as national and regional trends, is recommended and encouraged in order to promote the orderly development of the San Carlos Apache Airport.

At airports which are not served by air traffic control towers, estimates of existing aviation activity are necessary in order to form a basis for the development of realistic forecast projections. These estimates are based upon a review of available historical data, as well as contacts with airport users.

Following the development of the estimated current demand, projections are made based upon established growth rates, area demographics, industry trends and other important indicators. Forecasts are prepared for the Initial Term (1997-2001), the Intermediate Term (2002-2006) and the Ultimate Term (2007-2016) time frames. Having forecasts within these time frames will allow the construction of airport improvements to be timed to meet demand, but not so early as to remain idle for an unreasonable length of time.

There are four types of aircraft operations which are considered in the planning

process. These are termed local, based, itinerant, and transient. They are defined as follows:

- **Local operations** are defined as aircraft movements (departures or arrivals) for the purpose of training, pilot currency or pleasure flying, within the immediate area of the local airport. These operations typically consist of touch-and-go operations, practice instrument approaches, flights to and within local practice areas, and pleasure flights which originate and terminate at the airport under study.

- **Itinerant operations** are defined as arrivals and departures other than local operations, as described above. This type of operation is closely tied to local demographic indicators, such as local industry and business use of aircraft and usage of the facility for recreational purposes.

- **Based aircraft operations** are defined as the total operations made by aircraft based at the airport under study, with no attempt to classify the operations as to purpose.

- **Transient operations** are defined as the total operations made by aircraft other than those based at the airport under study. These operations typically consist of business or pleasure flights originating at other airports, with termination or a stopover at the study airport.

The terms transient and itinerant are sometimes erroneously used interchangeably. This study will confine analysis to local versus itinerant operations.

4.1 AVAILABLE ACTIVITY FORECASTS

The establishment of an accurate basis for the forecasting of future aviation activity is of primary importance in any planning effort. The recommended practice is to begin with the examination of prior estimates and forecast figures.

In an attempt to arrive at a reasonable estimate of current usage of the San Carlos Apache Airport and to facilitate development of accurate forecast estimates, a review of available data was made. The data sources examined included the following:

- [1] National Plan of Integrated Airport Systems 1990-1999, Federal Aviation Administration (NPIAS).

- [2] Arizona State Aviation Needs Study, Arizona Department of Transportation Aeronautics Division, 1995 (SANS).

- [3] Arizona State Aviation System Plan, Arizona Department of Transportation, Aeronautics Division, 1988 (ASASP).

The *FAA Terminal Area Forecasts for Fiscal Years 1991-2005* and *Fiscal Years 1995-2010*, and the *1993 FAA Census of U.S. Civil Aircraft* provided additional useful information for national and regional trends.

Estimates of existing operations and based aircraft for The San Carlos Apache Airport were developed by the Federal Aviation Administration and the State of Arizona, and are documented in the above referenced publications. The forecasts contained in these documents are discussed below and are depicted in Figure 4-1 along with the independent forecasts developed for this report.

The National Plan of Integrated Airport Systems, or NPIAS, contains estimates of existing operations for all airports included in the Plan. The NPIAS indicated 17,000 total estimated annual operations at the San Carlos Apache Airport in calendar year 1990, which is forecasted to increase to 24,000 by 1999.

The forecasts contained in the Arizona State Aviation Needs Study indicate an estimated 5,528 operations in the year 2000 and 6,054 in the year 2015. The estimated annual operations were derived by the State Aeronautical Division from forecasted registered aircraft, which were in turn based on the forecasted number of licensed pilots in Arizona.

The Arizona State Aviation System Plan (ASASP) also includes forecasts for the San Carlos Apache Airport. The ASASP indicates 5,916 total annual operations in the base year 1996, forecasted to increase to 6,996 by the year 2001, then to 9,461 by the year 2010. Forecasts in the ASASP were derived using regression analysis based on population and per capita income variables.

The NPIAS estimated 31 based aircraft at the San Carlos Apache Airport in 1990, which is forecasted to remain constant through 1999.

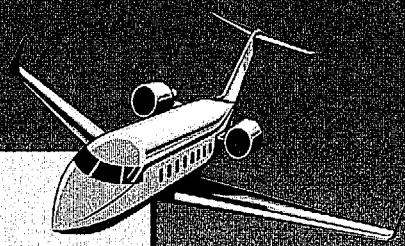
The Arizona State Aviation Needs Study indicates 20 based aircraft in the year 1995, forecasted to increase to 23 in the year 2015. The calculated average number of total operations per based aircraft is 263, far below the 1989 State average for all airports of 626 and the 1994 FAA Western Pacific Region average for towered airports of 966.

The ASASP forecasted 32 based aircraft in the base year 1996, increasing to 37 by the year 2001, then to 48 by 2010. The calculated average number of total operations per based aircraft according to the ASASP is 186. Again, this is below the State and Regional averages.

4.2 FAA RECORDS OF BASED AIRCRAFT AND OPERATIONS

The FAA 5010 form is the official master record kept by the Federal Aviation Administration to document airport physical conditions and other pertinent information. The record includes an annual estimate of aircraft activity as well as the number of based aircraft.

Comparison of Forecasts of Annual Aircraft Operations



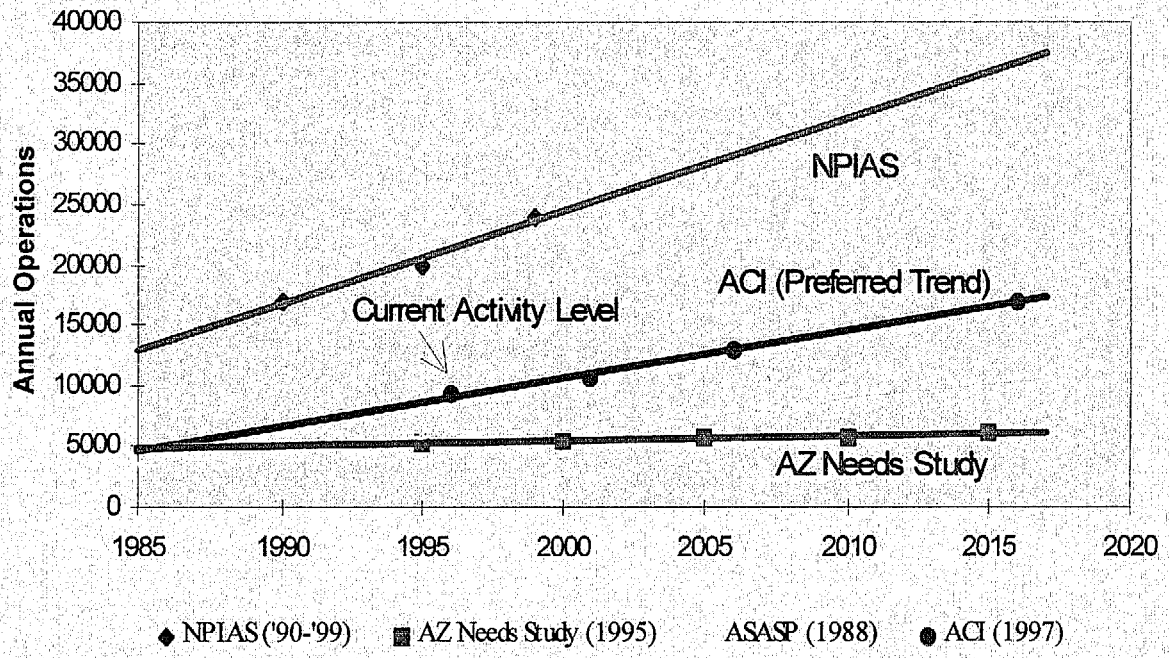


Figure 4-1

The 5010 forms for calendar years 1987 through 1993 indicate the following record numbers of based aircraft and annual operations at San Carlos Apache Airport as shown in Table IV-1. As discussed in Section 4.4, there is a discrepancy in the FAA 5010 forms and the actual based aircraft and aircraft operations data resulting from a current physical inventory.

TABLE IV-1
FAA FORM 5010 RECORDS OF BASED AIRCRAFT AND OPERATIONS

BASED AIRCRAFT						
Year	**Single Engine**	**Multi Engine**	**GA Jets**	**Helicopter**	**Other**	**TOTAL**
1989	35	3	1	0	0	39
1990	35	3	1	0	3	39
1991	*not available*					
1992	40	7	0	1	0	48
1993	*not available*					
1994	40	7	0	1	0	48
ANNUAL OPERATIONS						
Year		**Local**	**Itinerant**	**Air Taxi**	**Military**	**TOTAL**
1989		8,000	8,000	500	200	16,700
1990		8,000	8,000	500	200	16,700
1993	*not available*					
1992		12,000	4,000	0	200	16,200
1993	*not available*					
1994		12,000	4,000	0	200	16,200

Source: FAA 5010 Forms calendar years 1987 through 1994.

4.3 DETERMINATION OF BASED AIRCRAFT ACTIVITY: USER SURVEY RESULTS

In the process of preparing numerous airport master plans for U.S. general aviation airports, the consultant has accumulated an extensive database of information regarding aircraft operations. Over the years, airport user survey questionnaires have been distributed to aircraft owners who base their aircraft at 19 different airports. These questionnaires made inquiry as to the number of total operations performed by each based aircraft.

The results of the surveys, in terms of total annual operations by based aircraft, are summarized in Table IV-2.

TABLE IV-2
AIRPORT USER SURVEYS 1988-1994
SUMMARY OF BASED AIRCRAFT OPERATIONS

AIRPORT	YEAR	Annual Operations
Rexburg-Madison County Airport (ID)	1994	427
Pershing County - Derby Field (NV)	1993	205
Douglas Municipal Airport (AZ)	1994	138
Sawyer County - Hayward Municipal Airport (WI)	1988	208
Buffalo Municipal Airport (MN)	1989	481
Mora Municipal Airport (MN)	1989	232
Two Harbors Municipal Airport (MN)	1989	275
Rusk County Airport (WI)	1989	97
Chippewa Valley Regional Airport (WI)	1990	217
Cumberland Municipal Airport (WI)	1990	220
Canby Municipal Airport (MN)	1991	118
Glencoe Municipal Airport (MN)	1991	119
Portage Municipal Airport (WI)	1992	360
Rush City Municipal Airport (MN)	1992	116
Thief River Falls Regional Airport (MN)	1992	194
Brainerd -Crow Wing County Regional (MN)	1990	566
Cambridge Municipal Airport (MN)	1993	115
Cloquet Municipal Airport (MN)	1993	410
Red Wing Municipal Airport (MN)	1994	128
Average Annual Operations by Each Based Aircraft		**244**

Source: Nicholas J. Pela and Armstrong Consultants, Inc. research

A User's Survey for San Carlos Apache Airport was distributed in October, 1996. Thirty percent of the recipients responded to the questionnaire. The responses indicated an average of 163 operations per based aircraft which is slightly lower than the average usage reported above.

4.4 AIRPORT TRAFFIC MIX DETERMINATION

An inventory of aircraft which are actually based at the San Carlos Apache Airport was conducted as a part of the initial data collection process for this master plan. The inventory reveals a discrepancy between the FAA records of based aircraft and the number of aircraft actually present at the airport. This is illustrated in Table IV-3.

TABLE IV-3
ACTUAL BASED AIRCRAFT VERSUS FAA RECORDS

	Single Engine	Multi Engine Piston	Multi Engine Turbo Prop	GA Jet	Rotor-craft	Other	TOTAL
1994 Form 5010	40	7	0	0	1	0	48
Inventory (10/96)	17	3	0	1	2	0	23

For the purposes of this study it is appropriate to use the actual inventory data as a baseline for future projections. The FAA 5010 is not believed to accurately reflect the historical, nor current, number of based aircraft. The FAA master record will be updated to reflect the actual count.

As a means by which to compare the current fleet mix at the Globe San-Carlos Regional Air Facility to that of the U.S. as a whole, reference was made to the FAA's *Census of U.S. Civil Aircraft.* The approximate mix of the national general aviation fleet is compared to that of the San Carlos Apache Airport in Table IV-4.

TABLE IV-4
ACTUAL FLEET MIX AT SAN CARLOS APACHE AIRPORT VERSUS APPROXIMATE U.S. GENERAL AVIATION FLEET MIX

	Single Engine	ME Piston	Turbo Prop	GA Jet	Rotor-craft	Other
U.S. FLEET	78.0%	9.8%	2.0%	2.0%	4.0%	4.2%
SAN CARLOS	73.9%	13.0%	---%	4.4%	8.7%	----%
AVERAGE	*76.0%*	*11.4%*	*1.0%*	*3.2%*	*6.3%*	*2.1%*

Since it is highly probable that in the future the mix of aircraft at San Carlos Apache Airport will tend toward the national levels, the average of the U.S. and present San Carlos Apache Regional fleet mix will be used to develop forecasts of based aircraft.

4.5 DETERMINATION OF EXISTING ACTIVITY LEVEL

In order to determine the existing level of activity at the San Carlos Apache Airport, the data presented above was integrated as follows:

- The estimated number of annual *based* operations was calculated as the estimated operations per resident aircraft (obtained from airport user's surveys) multiplied by the number of based aircraft (163 x 23 = 3,749).

- Transient operations at airports with no intensive training activity will typically account for between 67% and 70% of total activity. Based on interviews with Mace Aviation and a log of transient businesses using San Carlos Apache Airport supplied by the Globe/Gila County Airport Board, it is estimated that transient operations at San Carlos Apache Airport account for approximately 60% of total

general aviation operations. Based on the number of based aircraft operations, the estimated number of transient operations is 5,624 and total annual operations is 9,370. This results in a total of 405 total annual operations per based aircraft, which is consistent with an airport with recreational aircraft owners, no flight training, and moderate business users.

- Based on the responses to airport user's surveys and interviews with Mace Aviation, local operations are estimated at approximately 217 per based aircraft, resulting in a corresponding estimate of 190 itinerant operations per based aircraft. This estimate is slightly lower than the median number of itinerant operations per based aircraft found in FAA surveys at non-towered general aviation airports across the nation as shown in Figure 4-2. The resulting estimated number of local and itinerant operations per based aircraft are 5,000 and 4,370 respectively.

- The average of the U.S. general aviation fleet mix and the present mix at the San Carlos Apache Airport were used to establish the relative percentage of use by each type of aircraft represented. The estimated level of existing aircraft activity for the base year of this study (1996) is presented in Table IV-5.

TABLE IV-5
EXISTING AIRCRAFT ACTIVITY LEVELS - BASE YEAR 1996

	Based	OPERATIONS		
	Aircraft	Local	Itinerant	TOTAL
Single-Engine	17	3,800	3,400	7,200
Multi-Engine Piston	3	500	500	1100
Multi-Engine Turboprop[1]	0	50	50	100
Jet	1	100	200	300
Rotorcraft	2	300	300	600
Other	0	0	100	100
TOTAL	**23**	**5,000**	**4,400**	**9,400**

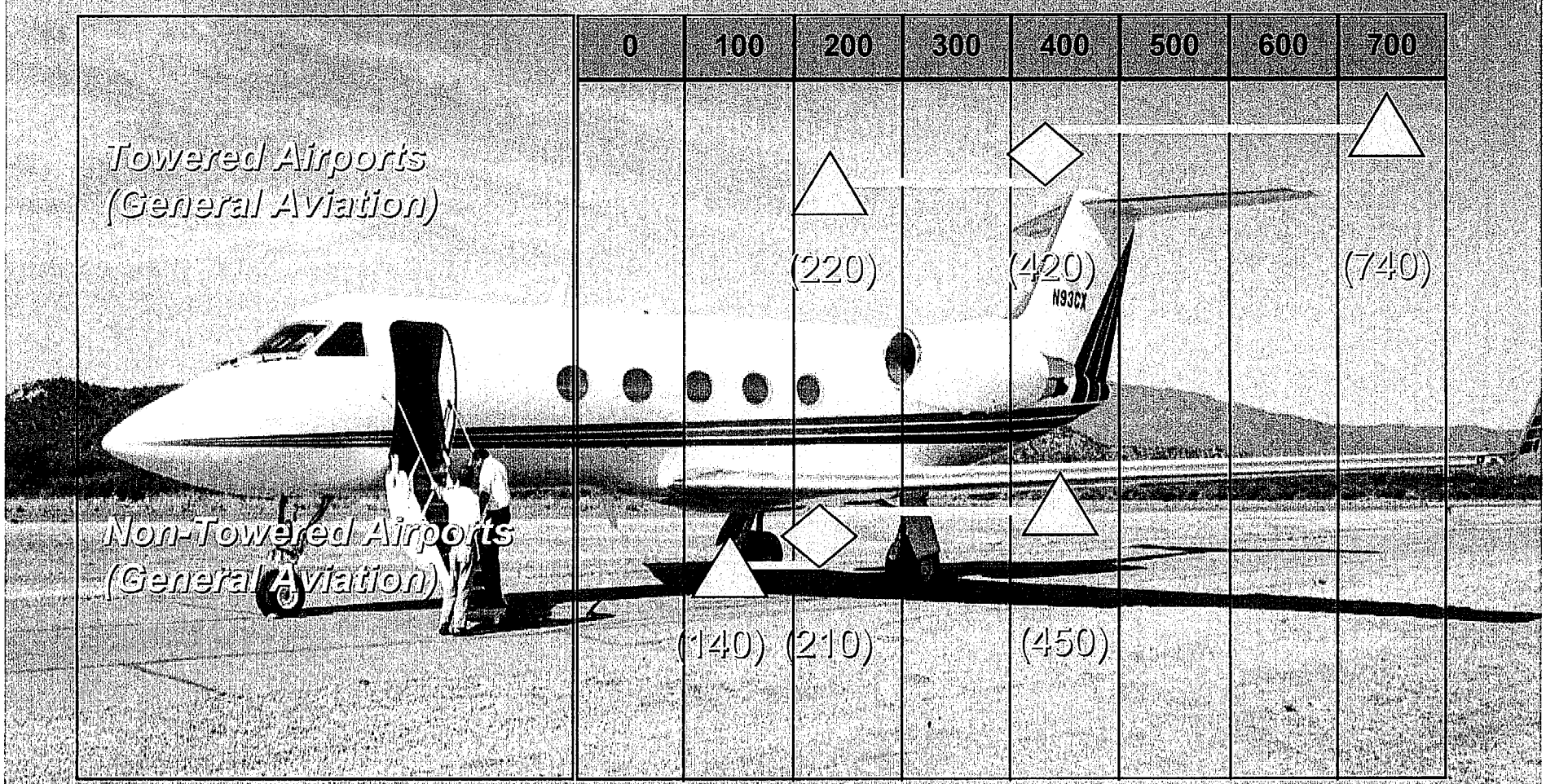
Operations rounded to nearest hundred, except for [1], rounded to nearest ten.

4.6 DEVELOPMENT OF AVIATION FORECASTS

The procedure utilized to forecast general aviation activity at San Carlos Apache Airport considers the relationship between current aviation activity, population, and personal income. The assumption is made that, with a constant per capita income, general aviation activity will vary directly with population. In theory, when personal income increases a larger percentage of income is available to be used in acquisition and use of general aviation aircraft.

A forecast of based aircraft was first derived using per capita registered aircraft in Gila County and population projections obtained from the Arizona Department of Economic Security. Annual operations were then derived using estimates of local and itinerant operations per based aircraft. Finally, the forecasted fleet mix was applied to the total annual operations to determine operations by respective aircraft type.

Number of Itinerant General Aviation Operations Per Based Aircraft



Minimum, medium, and maximum numbers from FAA Surveys

Figure 4-2

4.6.1 Based Aircraft

The relationship between area wide population and based aircraft was analyzed to determine a factor for based aircraft per 1,000 people. According to the FAA Census of U.S. Civil Aircraft CY 1993, the average number of aircraft per 10,000 people in the State of Arizona is 16.4. This factor was calculated for Gila County, and the Globe/Miami area. The number of registered aircraft per 10,000 people in Gila County, based on 1995 figures, is 20.8. Furthermore, the number of based aircraft at the San Carlos Apache Airport per 10,000 people in Globe/Miami area is 25.8.

Population projections for Gila County were obtained from the Arizona Department of Economic Security. The population of the Globe/Miami area represents 20.6% of the Gila County population. This percentage is assumed to remain constant throughout the planning period. The factor of 25.8 based aircraft per 10,000 people was applied to the Globe/Miami area population projections to arrive at the estimated total based aircraft. The forecasted fleet mix percentages were then applied to the based aircraft figures to calculate the estimated based aircraft by respective aircraft type. The results of these calculations are depicted in Table IV-6 and Figure 4-3.

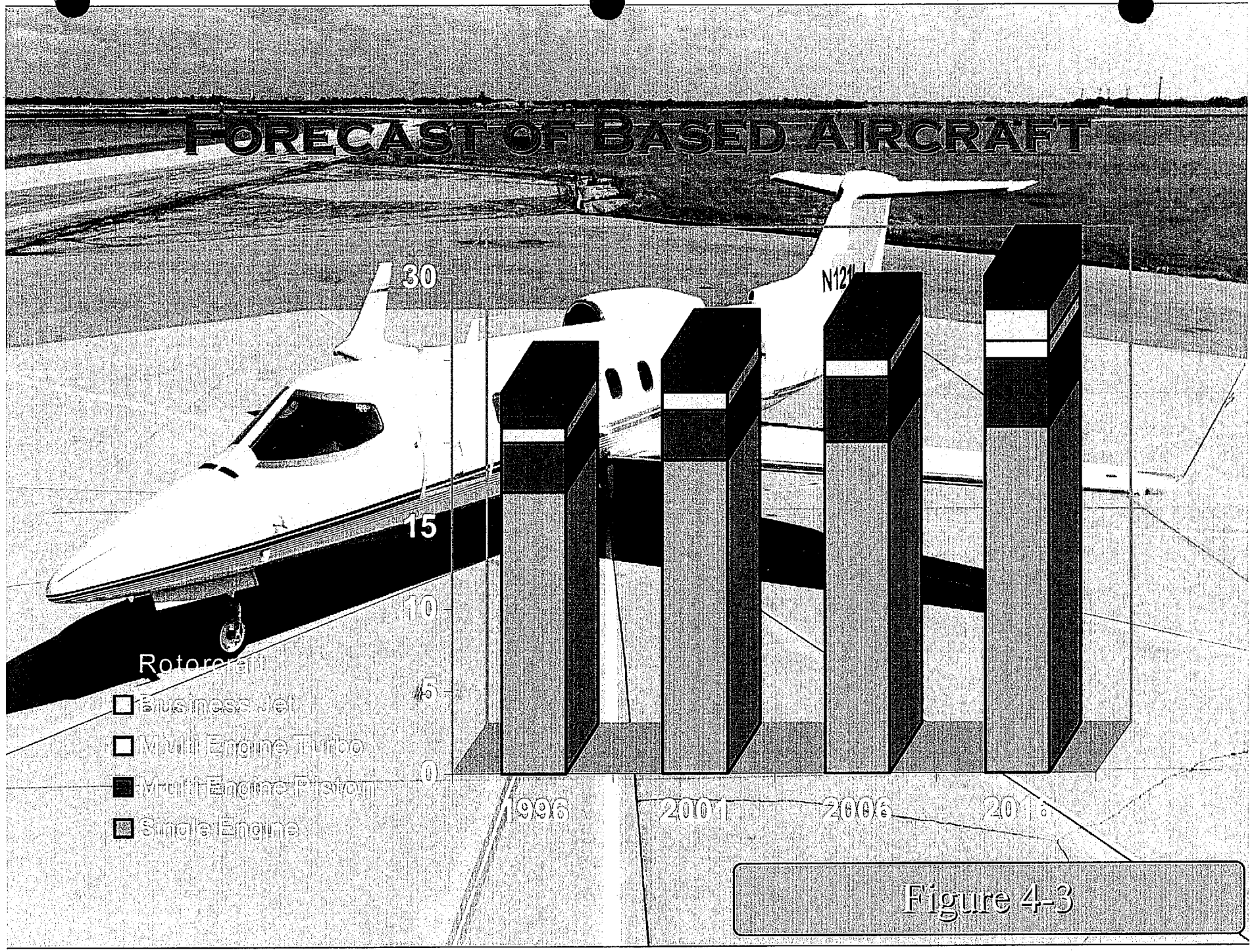

FORECAST OF BASED AIRCRAFT
30
15
10
5
0
Rotorcraft
Business Jet
Multi Engine Turbo
Multi Engine Piston
Single Engine
1996
2010
2006
20
N121

Figure 4-3

TABLE IV-6
FORECASTS OF BASED AIRCRAFT

	1996	2001	2006	2016
	Estimated	Forecasted		
Gila County Population[1]	44,075	48,500	51,450	57,335
Globe/Miami Population	**9,098**	**9,991**	**10,599**	**11,811**
Based Aircraft				
Single-Engine	17	19	20	21
Multi-Engine Piston	3	3	4	4
Multi-Engine Turboprop	0	0	0	1
Jet	1	1	1	2
Rotorcraft	2	2	2	2
Total	**23**	**25**	**27**	**30**

[1]*Source: Arizona Department of Economic Security*

4.6.2 Annual Aircraft Operations

The estimated number of aircraft operations per based aircraft for the base year, 1996, is 405. Broken down into local and itinerant operations this equates to 218 and 190 operations respectively. A significant number of local operations occurs from the on field Fixed Base Operator (FBO). Mace Aviation is regionally known for the excellent service they provide in aircraft repair. Mace Aviation also handles a substantial number of aircraft and helicopters which the FBO buys, repairs or upgrades, and sells on an annual basis. Consequently, the FBO provides a substantial contribution to the number of operations that the San Carlos Apache Airport currently experiences.

An increase in transient aircraft, and in turn an increase in itinerant operations, is expected throughout the planning period as a direct result of the establishment of the Apache Gold Casino across the street from the airport and continued business development in the local area. As discussed in Chapter 3, Socioeconomic Characteristics, visitors to the casino arriving by aircraft will most likely be wealthy individuals arriving by private business jet, or tourist groups arriving by small charter or air taxi aircraft. As a result, the number of itinerant operations per based aircraft is expected to increase to 220 in the 0 to 5 year time frame, 275 in the 6 to 10 year time frame, and 350 in the 11 to 20 year time frame. This estimated increase in itinerant operations corresponds to 1, 3, and 6 flights (2, 6, and 12 operations) daily of Casino visitors in each respective time frame. The number of local operations per based aircraft is expected to remain constant over the planning period. The forecasted

numbers of annual operations (local and itinerant) are shown in Table IV-7 and in Figure 4-4.

Figure 4-1 is an illustration of the comparison of the NPIAS forecasts for 1985 through 1995, the Arizona State Aviation System Plan (ASASP), and Arizona State Aviation Needs Study projections for San Carlos Apache Airport, and the independent forecasts developed in this study. The preferred trend line for the planning period correlates to an average annual increase in operations of approximately 4 percent.

TABLE IV-7
FORECAST OF GENERAL AVIATION ACTIVITY

Year	Based Aircraft	Local Operations	Itinerant Operations	Total Operations
1996	23	5,000	4,400	**9,400**
2001	24	5,200	5,300	**10,500**
2006	27	5,600	7,400	**13,000**
2016	30	6,500	10,500	**17,000**

Annual operations have been rounded to the nearest hundred.

To estimate the number of operations by aircraft type, local and itinerant operations must be evaluated separately. Local operations will most likely conform to the forecasted fleet mix percentages; however, the increased itinerant operations discussed above are expected to be accomplished by business jets and medium sized piston and turboprop aircraft. Therefore; the forecasted fleet mix percentages were applied to the number of itinerant operations per based aircraft (190), and the projected increases in itinerant operations for each planning period were distributed among the multi-engine and jet aircraft. Table IV-8 depicts the forecasted annual operations by respective aircraft type.

Forecast of Annual Operations

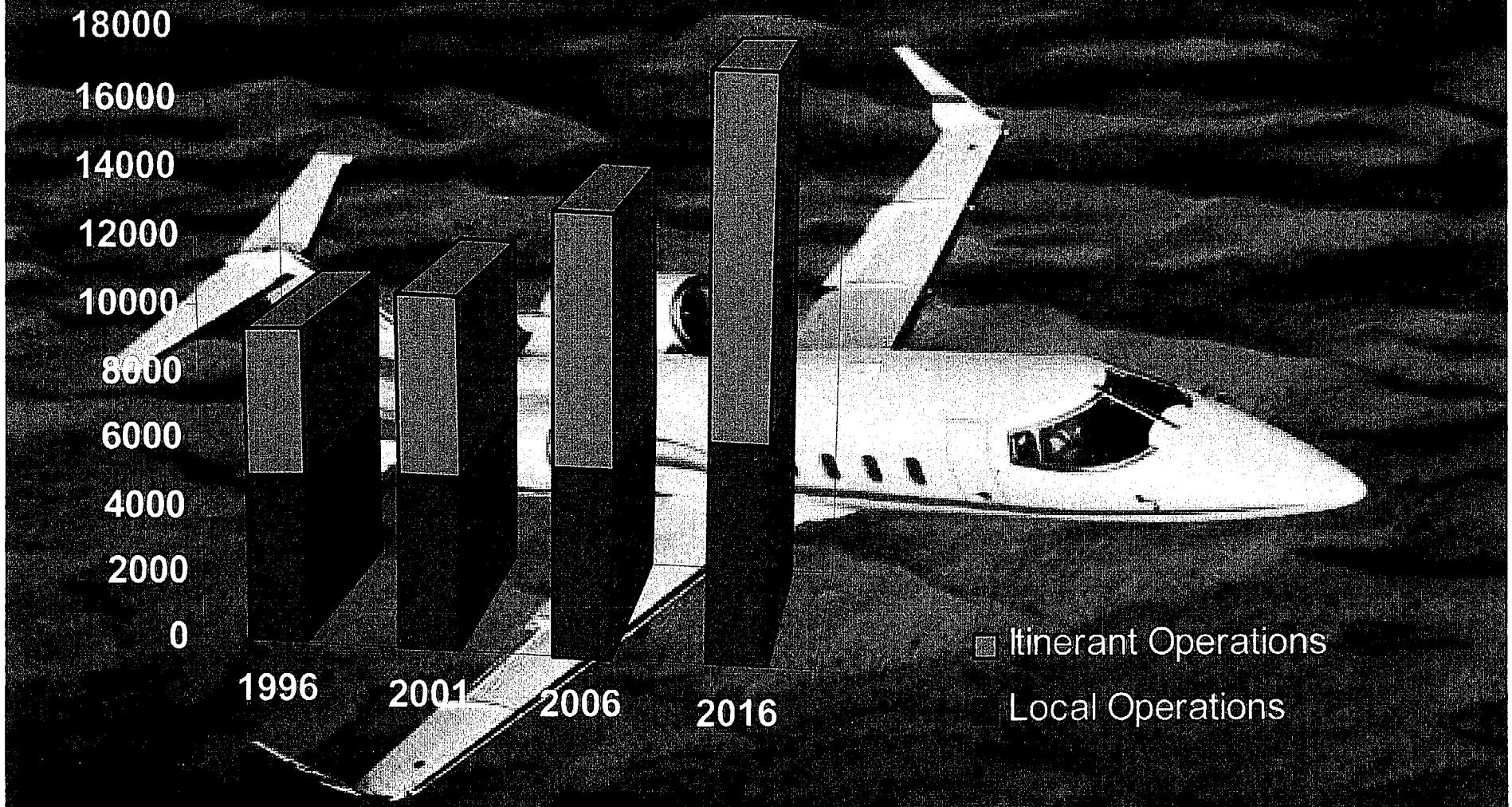


Figure 4-4

TABLE IV-8
DETAILED FORECASTS BY AIRCRAFT TYPE

Based Aircraft and Annual Aircraft Operations				
	1996	**2001**	**2006**	**2016**
Single Engine	17	19	20	21
Local	3800	3950	4260	4940
Itinerant	3340	3480	3880	4510
ME Piston	3	3	4	4
Local	570	590	640	740
Itinerant	500	520	580	650
ME Turboprop	0	0	0	1
Local	50	50	60	70
Itinerant	40	400	1000	2460
Business Jet	1	1	1	2
Local	160	170	180	210
Itinerant	140	510	1500	2390
Rotorcraft	2	2	2	2
Local	320	330	350	410
Itinerant	280	290	320	360
Other	0	0	0	0
Local	110	110	120	140
Itinerant	90	100	110	120
TOTAL	**9,400**	**10,500**	**13,000**	**17,000**

4.7 AIRPORT SEASONAL USE DETERMINATION

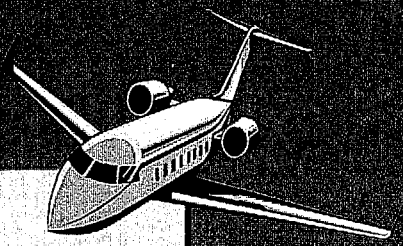
A seasonal fluctuation in aircraft operations may be expected at any airport. This fluctuation is most apparent in regions with severe winter weather patterns and at nontowered general aviation airfields.

The fluctuation is less pronounced at major airports, with a high percentage of commercial and scheduled airline activity.

The local FBO reports a substantially higher number of operations in summer months than off season months which is consistent with nontowered airports. Increasing use of San Carlos Apache Airport for business purposes and Casino visits versus recreational flying will result in a less pronounced seasonal activity fluctuation falling somewhere between that of towered and nontowered facilities.

Based upon experience with nontowered airports located in the same latitude as San Carlos Apache Airport, a representative approximate seasonal use trend curve was selected. This is presented in Table IV-9 and in Figure 4-5. The average seasonal use trend for FAA towered airports from the 1979-84 FAA records of total aircraft

Seasonal Use Trend



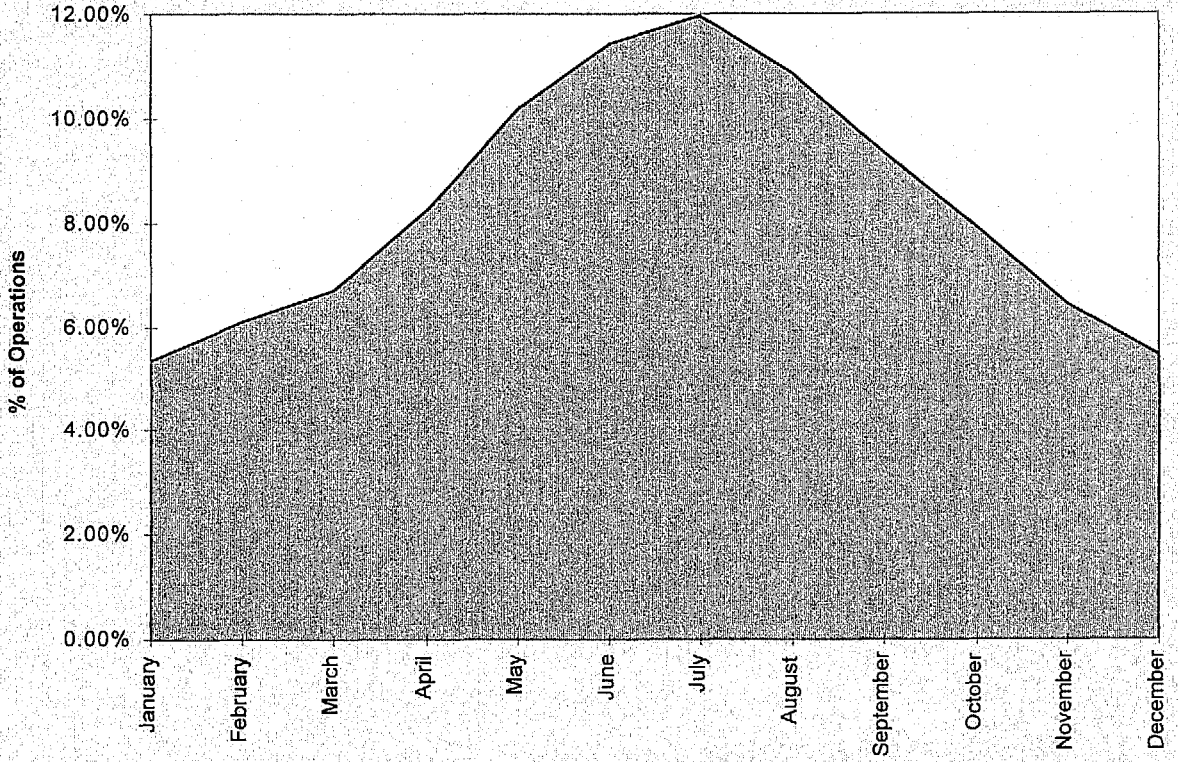


Figure 4-5

operations handled by tower facilities nationally (from *FAA Statistical Handbook of Aviation*) is also included in the table. The average of the two curves is assumed to represent probable seasonal fluctuations at San Carlos Apache Airport.

TABLE IV-9
SEASONAL USE TREND CURVES

MONTH	Nontowered	FAA Towered	AVERAGE
January	3.5%	7.2%	5.35%
February	4.0%	8.2%	6.10%
March	4.8%	8.6%	6.70%
April	7.5%	9.0%	8.25%
May	11.3%	9.1%	10.20%
June	13.5%	9.4%	11.45%
July	14.8%	9.1%	11.95%
August	13.0%	8.7%	10.85%
September	10.0%	8.7%	9.35%
October	8.0%	7.8%	7.90%
November	5.8%	7.1%	6.45%
December	3.8%	7.1%	5.45%

4.8 AIRPORT CAPACITY CALCULATION METHODOLOGY

The methodology for computing the relationship between an airport's demand versus its capacity is contained in FAA Advisory Circular AC 150/5060-5, *Airport Capacity and Delay.*

In order to facilitate this comparison, computations were made to determine the hourly capacity of the existing airport in Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) conditions. The Annual Service Volume (ASV) of the airport in its ultimate development condition was also determined.

The hourly capacity determinations were made using the assumptions recommended in the Advisory Circular for the particular airport layout and conditions, combined with the forecast operational data generated with this study. The physical aspects of the four aircraft Classes, not to be confused with the aircraft approach categories discussed in Chapter 2, are described in Table IV-10 below. The assumptions used in the capacity calculations are: 1) a traffic mix of approximately 85% of operations by Class A and B aircraft, 15% by Class C aircraft, and none by Class D aircraft, 2) percent of arrivals equals departures, 3) touch-and-goes account for less than 50 % of the operations, 4) a full-length parallel taxiway is provided, and 5) there are no airspace limitations which would adversely impact or otherwise restrict aircraft which could operate at the airport.

The San Carlos Apache Airport, in its existing configuration, operates only during visual meteorological conditions. Nonprecision instrument operations are expected for the ultimate airport configuration.

TABLE IV-10
FAA AIRCRAFT CLASSIFICATIONS FOR CAPACITY CONSIDERATIONS

CLASS	MAXIMUM TAKEOFF WEIGHT	ENGINES
A	12,500 lbs. or less	Single
B	12,500 lbs. or less	Multi Engine
C	12,500 to 300,000 lbs.	Multi Engine
D	Over 300,000 lbs.	Multi Engine

4.9 RUNWAY CAPACITY

Using the above conditions and applying them to the Hourly Capacity charts in the Advisory Circular, it is seen that the average peak capacities for the existing airport with a full length parallel taxiway are as follows:

TABLE IV-11
HOURLY CAPACITY - OPERATIONS PER HOUR

	VFR	IFR
RUNWAY 9	98	59
RUNWAY 27	98	59

Assuming no significant change in the traffic mix, the proposed development at San Carlos Apache Airport is not expected to increase the capacity of the airport, however; lengthening the runway will increase the utility of the airport and relocating the runway to meet FAA runway/taxiway separation standards will increase the safety of the airport. The runway capacities will remain the same throughout the planning period.

4.10 HOURLY DEMAND AND PEAKING TENDENCIES

In order to arrive at a reasonable estimate of the actual demand upon the airport facilities, it was necessary to develop a method to calculate the estimated Maximum Peak Hourly Demand which might be expected to occur. The Seasonal Use Trend Curve, as presented in Table IV-9, was used as a tool to determine this usage.

Using the Seasonal Use information, a formula was derived which will calculate the average daily operations in a given month, based on the percentage of the total annual operations for that month, as determined by the curve. The formula is as follows:

Where	T	=	Monthly percent of use (from curve).
	M	=	Average monthly operations.
	A	=	Total annual operations.
	D	=	Average Daily Operations in a given month.
	M	=	A (T / 100)
	D	=	M / (365 / 12)

Experience has shown that approximately 90% of total daily operations will occur between the hours of 7:00 AM and 7:00 PM (12 hours) at a typical general aviation airport, and that the maximum peak hourly occurrence may be 50% greater than the average of the hourly operations calculated for this time period.

The Estimated Peak Hourly Demand (P) in a given month was, therefore, determined by compressing 90% of the Average Daily Operations (D) in a given month into the 12 hour peak use period, reducing that number to an hourly average for the peak use period, and increasing the result by 50%, as follows:

Where	D	=	Average Daily Operations in a given month.
	P	=	Peak Hourly Demand in a given month.
	P	=	1.5 (0.90D / 12)

The calculations were made for each month of each phase of the planning period. The results of the calculations are shown in Table IV-12.

As is evident in the Table, the Maximum Peak Hourly Demand occurs under VFR weather conditions in the month of July, with 4 operations per hour in the existing time frame (1996) and 8 operations per hour in 2016.

TABLE IV-12
ESTIMATED HOURLY DEMAND / MONTH

Monthly/Daily/Hourly Demand

Base Year: 1996
Operations: 9,400

Month	% Use	Operations Monthly	Operations Daily	Operations Hourly
January	5.35	503	17	2
February	6.10	573	19	2
March	6.70	630	21	2
April	8.25	776	25	3
May	10.20	959	32	4
June	11.45	1,076	35	4
July	**11.95**	**1,123**	**37**	**4**
August	10.85	1,020	34	4
September	9.35	879	29	3
October	7.90	743	24	3
November	6.45	606	20	2
December	5.45	512	17	2

Planning Year: 2001
Operations: 10,500

Month	% Use	Operations Monthly	Operations Daily	Operations Hourly
January	5.35	562	18	2
February	6.10	641	21	2
March	6.70	704	23	3
April	8.25	866	28	3
May	10.20	1,071	35	4
June	11.45	1,202	40	4
July	**11.95**	**1,255**	**41**	**5**
August	10.85	1,139	37	4
September	9.35	982	32	4
October	7.90	830	27	3
November	6.45	677	22	3
December	5.45	572	19	2

TABLE IV-12 (Continued)
ESTIMATED HOURLY DEMAND / MONTH

Monthly/Daily/Hourly Demand				
Planning Year: 2006 Operations: 13,000				
		Operations		
Month	% Use	Monthly	Daily	Hourly
January	5.35	696	23	3
February	6.10	793	26	3
March	6.70	871	29	3
April	8.25	1,073	35	4
May	10.20	1,326	44	5
June	11.45	1,489	49	6
July	**11.95**	**1,554**	**51**	**6**
August	10.85	1,411	46	5
September	9.35	1,216	40	4
October	7.90	1,027	34	4
November	6.45	839	28	3
December	5.45	709	23	3
Planning Year: 2016 Operations: 17,000				
		Operations		
Month	% Use	Monthly	Daily	Hourly
January	5.35	910	30	3
February	6.10	1,037	34	4
March	6.70	1,139	37	4
April	8.25	1,403	46	5
May	10.20	1,734	57	6
June	11.45	1,947	64	7
July	**11.95**	**2,032**	**67**	**8**
August	10.85	1,845	61	7
September	9.35	1,590	52	6
October	7.90	1,343	44	5
November	6.45	1,097	36	4
December	5.45	927	30	3

The Maximum Peak Hourly Demand in the existing time frame represents approximately 4% of the estimated hourly capacity of the runway under VFR conditions, and ultimately 7% of the estimated hourly capacity of the runway under VFR conditions.

4.11 ANNUAL SERVICE VOLUME

The Annual Service Volume, or ASV, is a calculated reasonable estimate of an airport's annual capacity, taking into account differences in runway utilization, weather conditions and aircraft mix that would be encountered in a year's time. When compared to the forecast or existing operations of an airport, the ASV will give an indication of the adequacy of a facility in relationship to its activity level. The ASV is determined by reference to the charts contained in FAA Advisory Circular AC 150/5060-5.

The approximate Annual Service Volume for the San Carlos Apache Airport in its ultimate condition is 230,000 operations/year. Under these conditions, the facility will not exceed its capacity within the time frame of this study.

4.12 CRITICAL AIRCRAFT DETERMINATION

The "critical", or "design", aircraft for any given airport facility is defined as that aircraft (or group of aircraft) whose dimensional and/or performance characteristics are the basis for selection of facilities design criteria. The critical aircraft must be demonstrated to account for a minimum of 500 annual actual or forecast itinerant operations.

Different aircraft may govern the requirements for runway design, and for lateral and vertical separation standards. The factors usually considered are the aircraft maximum gross takeoff weight, approach speed category, wingspan, and tail height.

The critical aircraft currently using the San Carlos Apache Airport facilities is a mix of A-II, B-I, and B-II multi-engine piston, turboprop, and jet aircraft. Business jet operations account for an estimated 300 annual operations which are a combination of B-II and C-I aircraft. Operations of B-II aircraft account for over 500 annual itinerant operations at San Carlos Apache Airport, therefore, it is appropriate to designate the current Airport Reference Code as a B-II.

As future airport improvements are made, and as economic growth occurs in the service area, it may be assumed that accommodation of a wider range of jet and turboprop aircraft may be necessary. The activity forecasts indicate that operations by jet and turboprop aircraft will reach 1,130 operations by the year 2001, and 5,130 operations by the year 2016

In an attempt to identify the representative ultimate critical aircraft which may operate at the airport, an examination of the dimensional and performance characteristics of the business aircraft fleet was made. The aircraft considered were limited to those with maximum gross takeoff weights of 30,000 pounds or less, including approach classifications A, B, and C, Airplane Design Groups I and II. Although the number of C-II aircraft may not exceed 500 annual operations, the combination of C-II aircraft, along with B-II and C-I operations justify planning for an ultimate design aircraft with an ARC of C-II weighing 60,000 pounds or less. The forecasted ultimate design fleet is presented in Table IV-13 (Multi-Engine Propeller Aircraft) and Table IV-14 (Business Jet Aircraft).

TABLE IV-13
REPRESENTATIVE CRITICAL AIRCRAFT DESIGN FLEET
(Multi-Engine Propeller Aircraft)

San Carlos Apache Airport
Design Fleet (Multi-Engine Propeller)

P A R A M E T E R S :
DENSITY ALTITUDE : 6345 MSL
GENERAL TYPE CODE : Multi-Engine Propeller
U.S CUSTOMARY UNITS : Speed in knots.....Lengths in Feet.....Weight in Pounds

Greater Than:	0.00	0.00	0.00	0.00	0.00	-2.00
& Less Than:	121.00	79.00	200.00	100.00	400000.00	10000.00

Model	AppSpeed	WingSpan	AClength	TailHite	TOweight	RWindex
Beechcraft 65 Queen Air	90	45.88	33.33	14.17	7700	4001
Beechcraft B55	95	37.80	28.00	9.60	5100	----
Beechcraft E55	95	37.80	29.90	9.10	5300	----
Beechcraft 58	96	37.80	29.90	9.50	5550	----
Beechcraft 58P	101	37.80	29.90	9.10	6200	----
Beechcraft 58TC	101	37.80	29.90	9.10	6200	----
Beechcraft C99	107	45.90	44.50	14.40	11300	----
Beech Duchess 76	78	38.00	29.00	9.50	3900	----
Beech Duke B60	98	39.30	33.80	12.30	6775	----
Beechcraft C90	99	50.30	35.50	14.30	9650	----
Beechcraft F90	103	45.90	39.80	15.10	10950	----
Beechcraft B200	98	54.50	43.80	15.00	12500	4152
Beechcraft B200	98	54.50	43.80	15.00	11000	3869
Beechcraft B300	107	54.50	43.70	15.00	14000	----
Beechcraft 1900	120	54.50	57.80	14.90	15245	----
Beechcraft E-18S	87	49.20	35.10	10.50	9300	4496
Beechcraft B100	111	45.90	39.90	15.40	11500	4986
Beechcraft B100	111	45.90	39.90	15.40	10000	4336
BritainNorman BN2B	51	49.00	35.70	12.90	6600	----
Casa C-212	92	62.30	49.80	21.80	16427	----
Cessna T303	81	39.00	30.40	13.20	5150	----
Cessna 310R	93	36.92	31.96	10.67	5500	5397
Cessna 208 Caravan	72	51.80	37.60	14.20	7000	----
DHC-6-300	75	65.00	51.80	19.50	12500	----
Embraer EMB-110P2	94	50.30	49.50	16.10	12500	----
Fairchild 300	116	47.90	42.20	16.80	13230	----
Fairchild SA227-AC	113	57.00	59.40	16.70	14500	----
Fairchild SA227-PC	113	57.00	59.40	16.70	14500	----
GAF Nomad N24A	74	54.20	47.00	18.20	9400	----
Gulfstream AE840	98	52.10	43.00	15.00	10325	----
Gulfstream AE900	100	52.10	42.90	14.90	10700	----
Gulfstream AE1000	103	52.10	43.00	14.90	11200	----
Gulfstream I	113	78.30	75.30	23.00	34000	6121
International BN2A	65	53.00	44.80	14.20	10000	----
Lear Fan 2100	104	39.30	40.60	12.20	7350	----
Merlin IVC	113	57.00	59.33	16.67	12500	4276
Merlin IVC	113	57.00	59.33	16.67	16000	5886
Metro III	112	46.20	59.40	16.70	12500	4252
Metro III	112	46.20	59.40	16.70	16000	6203
Mitsubishi 2B-400	101	39.20	33.30	12.90	10470	----
Mitsubishi 2B-60	105	39.20	39.40	13.70	11575	----
Mitsubishi MU-300	109	43.40	48.30	13.80	14630	----

Model	AppSpeed	WingSpan	ACLength	TailHite	TOweight	RWindex
Partenavia P68C	74	39.40	31.30	11.20	4387	----
Piaggio P.166-DL3	86	48.20	39.30	16.50	9480	----
Piper PA-31-325	91	40.70	32.60	13.00	6500	----
Piper PA-31-350	96	40.70	34.60	13.00	7000	----
Piper PA-31 T1020	96	40.70	34.60	13.00	7000	----
Piper PA-31 T1040	101	41.10	36.70	12.80	9000	----
Piper PA31T-2XL620	104	42.70	36.70	12.80	9474	----
Piper PA-34-220T Seneca	83	38.90	28.60	9.90	4750	----
Piper PA-42-720	116	47.70	43.40	14.80	11200	----
Piper PA-42-1000	116	47.70	43.40	16.40	11950	----
Piper Aerostar 602	100	36.70	34.80	12.10	6000	----
Piper PA60-700P	92	36.80	34.00	12.10	6315	----
Piper PA-31P-350	95	44.50	34.50	13.00	7200	----
Piper PA-23-250 Aztec	77	37.17	31.17	10.25	5200	----
Saab 340B	104	70.33	64.67	22.50	30000	6824
Saab 340B	104	70.33	64.67	22.50	25000	4328
Saab-Fairchild SF 340A	104	70.33	64.67	22.50	28000	6405
Saab-Fairchild SF 340A	104	70.33	64.67	22.50	25000	4803
Short SD3.30	95	74.70	58.00	16.20	22900	----
Short SD3.60	104	74.80	70.80	23.70	26000	----
Weatherly 620	74	41.00	27.20	8.10	5600	----
Beech Starship 2000A	117	54.42	46.08	12.92	14900	----
Metro II SA226-TC	112	46.25	59.42	16.67	12500	4121
Metro II SA226-TC	112	46.25	59.42	16.67	10500	2685
Metro II SA226-TC	112	46.25	59.42	16.67	8500	2077
Embraer EMB-120 Brasilia	108	64.90	65.60	20.80	25353	6421
Embraer EMB-120 Brasilia	108	64.90	65.60	20.80	24000	5586
Cessna 425	103	44.10	35.90	12.60	8600	4926
Cessna 425	103	44.10	35.90	12.60	8200	4790
Cessna 441	99	49.30	34.70	12.80	9850	4735
Cessna 441	99	49.30	34.70	12.80	7800	4149
Cessna 340A	92	38.10	34.30	12.60	5990	4341
Cessna 340A	92	38.10	34.30	12.60	5000	2853
Cessna 402C	95	44.12	36.38	11.45	6850	4732
Cessna 402C	95	44.12	36.38	11.45	5500	2869
Cessna 414A	94	44.10	36.40	11.50	6750	5345
Cessna 414A	94	44.10	36.40	11.50	5700	3626
Cessna 421C	96	41.10	36.40	11.50	7450	4577
Cessna 421C	96	41.10	36.40	11.50	6200	2991

C R I T I C A L P A R A M E T E R S

Runway Length Index	6824	Saab 340B @ 30000 #
WingSpan	78.30	Gulfstream I
Tail Height	23.70	Short SD3.60
Aircraft Length	75.30	Gulfstream I
Takeoff Weight	34000	Gulfstream I
Approach Speed	120	Beechcraft 1900

Source ACDATA version 5.02

TABLE IV-14
REPRESENTATIVE CRITICAL AIRCRAFT DESIGN FLEET
(Business Jet Aircraft)

San Carlos Apache Airport
Design Fleet (Business Jet Aircraft)

P A R A M E T E R S :
DENSITY ALTITUDE : 6345 MSL
GENERAL TYPE CODE : Jets
U.S CUSTOMARY UNITS : Speed in knots.....Lengths in Feet.....Weight in Pounds

Greater Than:	0.00	0.00	0.00	0.00	0.00	-2.00
& Less Than:	121.00	79.00	200.00	100.00	400000.00	10000.00

Model	AppSpeed	WingSpan	AClength	TailHite	TOweight	RWindex
BAe Jetstream 3100	109	52.00	47.10	17.50	14550	----
Cessna Citation I C500	107	47.10	43.50	14.30	11850	----
Cessna 525 CitationJet	107	46.67	42.50	13.58	10400	----
Cessna Citation II C550	105	52.20	47.20	15.00	14300	----
Cessna Citation III C650	116	53.50	55.50	17.30	21000	----
Falcon 10	104	42.90	45.50	15.10	14000	3369
Falcon 10	104	42.90	45.50	15.10	16000	3986
Falcon 10	104	42.90	45.50	15.10	18740	5638
Falcon 20	107	53.50	56.30	17.40	18000	3285
Falcon 20	107	53.50	56.30	17.40	26000	5705
Falcon 200	114	53.50	56.30	17.40	20000	3534
Falcon 200	114	53.50	56.30	17.40	26000	4369
Falcon 200	114	53.50	56.30	17.40	30650	6910
Falcon 50	113	61.90	60.80	22.90	22000	3269
Falcon 50	113	61.90	60.80	22.90	30000	3736
Falcon 50	113	61.90	60.80	22.90	37480	5638
Falcon 900	100	63.40	66.30	24.80	45500	6903
Falcon 900	100	63.40	66.30	24.80	34000	3836
Falcon 900	100	63.40	66.30	24.80	28000	3052
HS.125-700	108	47.00	50.80	17.60	24800	----
HS.125-800	111	51.37	51.14	17.58	27400	----
Learjet 28/29	120	43.75	47.58	12.25	15000	4353
Learjet 28/29	120	43.75	47.58	12.25	13000	3636
Westwind Astra	110	52.67	55.58	18.17	24650	8322
Westwind Astra	110	52.67	55.58	18.17	23000	6536
Westwind Astra	110	52.67	55.58	18.17	20000	5086
Sabreliner NA-265-65	105	50.50	46.10	16.00	19000	5988
Sabreliner NA-265-40	120	44.50	43.80	16.00	18650	6672
Sabreliner NA-265-60	120	44.50	48.30	16.00	20000	7657
Cessna Citation I/SP	107	47.10	43.50	14.33	11850	4028
Cessna Citation I/SP	107	47.10	43.50	14.33	10000	2888

C R I T I C A L P A R A M E T E R S
Runway Length Index.....(8322) Westwind Astra @ 24650 #
WingSpan.....(63.40) Falcon 900
Tail Height.....(24.80) Falcon 900
Aircraft Length.....(66.30) Falcon 900
Takeoff Weight.....(45500) Falcon 900
Approach Speed.....(120) Learjet 28/29

Source: ACDATA version 5.02